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berries must be avoided, one can selectively deliver higher temperature superheated steam, usually more slowly, to raisin grapes to assist them in drying. In such a drying application, one preferably entrains a drying aid (such as methyl or ethyl oleate) in the flow of superheated steam, which assists in moisture evaporation across the usual waxy barrier on the fruit's skin.

Aspects of the invention will now be illustrated by the following examples which are intended to illustrate but not limit the invention.

EXAMPLE 1

A prototype of the superheated steam apparatus as described for grape defoliation was pulled by a tractor moving about 1-2 miles per hour through grape vine rows spaced 12 feet apart. With a 300 gallon water reservoir, superheated steam was applied to about 1-2 acres per hour. Within minutes of application, the treated leaves shriveled. The leaves were dry within an hour, followed by leave drop over the next several days. Further, leave hoppers on those directly treated leaves and adjacent leaves were killed and observed to have fallen from the growing vines; however, the developing grape berries were not harmed at all.

EXAMPLE 2

The top four inches of a worked soil bed had superheated steam applied. Samples of the soil were then inspected and were shown to be substantially sterilized.

EXAMPLE 3

The prototype of the superheated steam apparatus had the steam nozzle placed facing down to the row berm of orchard and vineyard rows at a distance 2 inches to 3 inches above the ground and was moved parallel to the ground at between ¼ mph and 1½ mph, depending upon the amount of vegetation to be killed. The superheated steam that was so delivered was in a temperature range of 500° F.-700° F. which was effective to kill the growing weeds and to keep most of the weed seeds that had dropped from germinating.

EXAMPLE 4

Methyl oleate and ethyl oleate are known and used to assist in speeding moisture evaporation through the waxy film that naturally occurs on the skin of fruits such as raisin grapes and prune plums. In an application of superheated steam for grape defoliation as described by Example 1, an additional operation was simultaneously performed by injecting Methyl oleate or ethyl oleate into the flowline 50 before the superheated steam flowed into nozzle 20. In this instance, the prototype had dual nozzles and a flow divisional valve controlled the superheated steam flow to the right or left nozzle. The superheated steam, which included methyl- or ethyl oleate, was thus applied to raisin grapes in conjunction to removal prior to harvest. This permitted more rapid moisture evaporation through the grape skin surfaces.

It is to be understood that while the invention has been described above in conjunction with preferred specific embodiments, the description and examples are intended to illustrate and not limit the scope of the invention, which is defined by the scope of the appended claims.

It is claimed:

1. An agricultural method for in the field use, comprising: generating steam in a first steam generator, the steam having water droplets therein; removing substantially all the water droplets from the steam so as to form saturated steam substantially free of water droplets;

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heating the supersaturated steam to at least about 300° F. in a second steam generator to form superheated steam; and,

selectively delivering sufficient of the superheated steam to soil in a field to kill undesired organisms.]

2. The method as in claim 1 wherein the superheated steam is delivered at a temperature above about 250° F.

3. The method as in claim 1 wherein the selective delivery includes penetrating the soil to a depth in a range of about two inches to about twenty inches to deliver the superheated steam therein.

4. The method as in claim 2 wherein the undesired organisms are weeds.

5. The method as in claim 2 wherein the undesired organisms are insects or worms.

6. The method as in claim 2 further comprising turning over an upper soil layer while selectively delivering the superheated steam thereto.

7. The method as in claim 1 wherein the undesired organisms are nematodes.

8. The method as in claim 3 wherein the selective delivery is prior to planting a crop.

9. A preplant treatment method for fields, comprising: generating steam in a first steam generator, the steam having water droplets therein;

removing substantially all the water droplets from the steam so as to form saturated steam substantially free of water droplets;

heating the supersaturated steam to at least about 300° F. in a second steam generator to form superheated steam; and,

selectively delivering sufficient of the superheated steam to soil in the field prior to planting to kill nematodes therein, the superheated steam being delivered at a temperature above 250° F.

10. The preplant treatment method as in claim 9 wherein the field is for planting strawberries.

11. A method for defoliating grape vines comprising: generating a flow of superheated steam; and, delivering the flow of superheated steam to basal leaves adjacent to developing grape berries.

12. The method as in claim 11 wherein the superheated steam delivered contacts the basal leaves and is in a temperature range of about 250° F. to about 500° F.

13. The method as in claim 11 wherein the flow of superheated steam is generated to be from about 300° F. to about 800° F. and is at a pressure of from about 5 psi to about 60 psi.

14. The method as in claim 11 wherein the superheated steam is substantially free of water droplets.

15. The method as in claim 11 wherein the generation of flow of superheated steam includes initially forming steam in a first steam generator followed by generating superheated steam in a second steam generator, wherein water droplets in the steam from the first steam generator are substantially removed before treatment in the second steam generator.

16. A method for treating raisin grapes or prune plums in the field, comprising:

generating a flow of superheated steam, the superheated steam having a drying adjuvant entrained therein; and, delivering the flow of superheated steam to the raisin grapes or prune plums.

17. The method as in claim 16 wherein the adjuvant is methyl oleate or ethyl oleate.

18. The method as in claim 16 wherein the flow of superheated steam delivered is effective to increase moisture evaporation from the raisin grapes or prune plums.

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Sub B2

Sub A1
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